PULSE TRANSIT TIME ESTIMATION FOR CONTINUOUS BLOOD PRESSURE MEASUREMENT: A COMPARATIVE STUDY

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Introduction: Continuous blood pressure (BP) monitoring provides important information about the cardiovascular system condition. Invasive methods are accurate but denote increased risk. Non-invasive methods are safe but less reliable and don´t provide continuous information. An alternative approach for a continuous, non-invasive measurement of BP is based on changes in pulse transit time (PTT). PTT is defined as the time delay between the R-wave of the electrocardiogram (ECG) and the peak value of the photoplethysmogram (PPG) signal acquired in the patient finger on the same cardiac cycle.

Objective: The main goal of this work is to estimate the PTT using different methodologies found in the literature, such as derivative based approaches and Discrete Wavelet (DWT) and Hilbert-Huang (HHT) transforms, and compare the results with ground truth values obtained manually.

Methods: Several ECG and PPG signals were obtained from a public physiologic signals database and from real data using in vivo patients. A derivative based approach to find the R-waves and the PPG peak values was implemented to estimate the PTT. Then, a previous signal processing using DWT and HHT was applied. Results provided from each methodology were compared with ground truth values.

Results and Conclusions: Globally all methods had similar results when using the database signals. However, using real data, the derivative based approach performed poorly. Due to noise, non-stationary and non-linearity nature of physiologic signals, methodologies that incorporate DWT or HHT provide accurate results.

Descriptors: Blood Pressure, Pulse Transit Time, Wavelet Transform, Hilbert-Huang Transform.